

What is claimed is:

1. A high density plasma processing apparatus generating an inductively coupled plasma that is highly uniform, the apparatus comprising:
 - a processing chamber providing a hermetically sealed plasma generating space and having a planar surface on a top wall;
 - a plurality of gas pipes that inject process gases into the processing chamber;
 - a plurality of loop-shaped antennas installed on the planar surface of the top wall of the processing chamber and connected in parallel with each other;
 - a resonance antenna coil receiving a high frequency power and including the plurality of loop-shaped antennas and a plurality of variable capacitor that are connected in parallel with the plurality of loop-shaped antennas in order to maintain a resonance state therebetween;
 - a means for heating the resonance antenna coil by way of using a heat exchange medium; and
 - a means for fixing a substrate inside the processing chamber parallel with the planar surface of the top wall of the processing chamber.
2. The apparatus according to claim 1, wherein the plurality of loop-shaped antennas of the antenna coil are hollow tubes that have empty spaces therein.
3. The apparatus according to claim 2, wherein the plurality of loop-shaped antennas of the antenna coil are made of silver-coated aluminum (Al).

4. The apparatus according to claim 2, wherein the means for heating the resonance antenna coil circulates the heat exchange medium into the empty space of the plurality of loop-shaped antennas.

5. The apparatus according to claim 1, further comprising a heater that supplies heat to the processing chamber.

6. The apparatus according to claim 1, wherein at least one gas pipe surrounds the means for fixing the substrate in a shape of a ring and the end of the this gas pipe bends toward and over the means for fixing the substrate so as to inject the process gases upward.

7. A high density plasma processing apparatus generating a plasma that is highly uniform, the apparatus comprising:

- a processing chamber providing a hermetically sealed plasma generating space and having a planar surface on a top wall;
- a plurality of gas pipes that inject process gases into the processing chamber;
- a plasma electrode receiving a first high frequency power and being installed on the planar surface of the top wall of the processing chamber;
- a plurality of loop-shaped antennas installed on a surface of the top wall of the processing chamber except the planar surface and connected in parallel with each other;
- a resonance antenna coil receiving a second high frequency power and including the plurality of loop-shaped antennas and a plurality of variable capacitor that are connected in parallel with the plurality of loop-shaped antennas in order to maintain a resonance state therebetween,

a means for heating the resonance antenna coil by way of using a heat exchange medium; and

a means for fixing a substrate inside the processing chamber parallel with the planar surface of the top wall of the processing chamber.

8. The apparatus according to claim 7, wherein the plurality of loop-shaped antennas of the antenna coil are hollow tubes that have empty spaces thereinside.

9. The apparatus according to claim 8, wherein the plurality of loop-shaped antennas of the antenna coil are made of silver-coated aluminum (Al).

10. The apparatus according to claim 8, wherein the means for heating the resonance antenna coil circulates the heat exchange medium into the empty space of the plurality of loop-shaped antennas.

11. The apparatus according to claim 7, where the first and second high frequency powers have a high frequency of greater than 1 MHz.

12. The apparatus according to claim 7, wherein at least one gas pipe surrounds the means for fixing the substrate in a shape of a ring and the end of the this gas pipe bends toward and over the means for fixing the substrate so as to inject the process gases upward.